Benefits of Electric Transportation and Goods Movement Technologies

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Reference: California Electric Transportation Coalition--D0286

Benefits of Electric Drive Technologies *Agenda*

1. Scope of TIAX Study
2. Applications Considered
3. Results
4. Summary Remarks

TIAX estimated the benefits of electric technologies in a variety of end-user applications

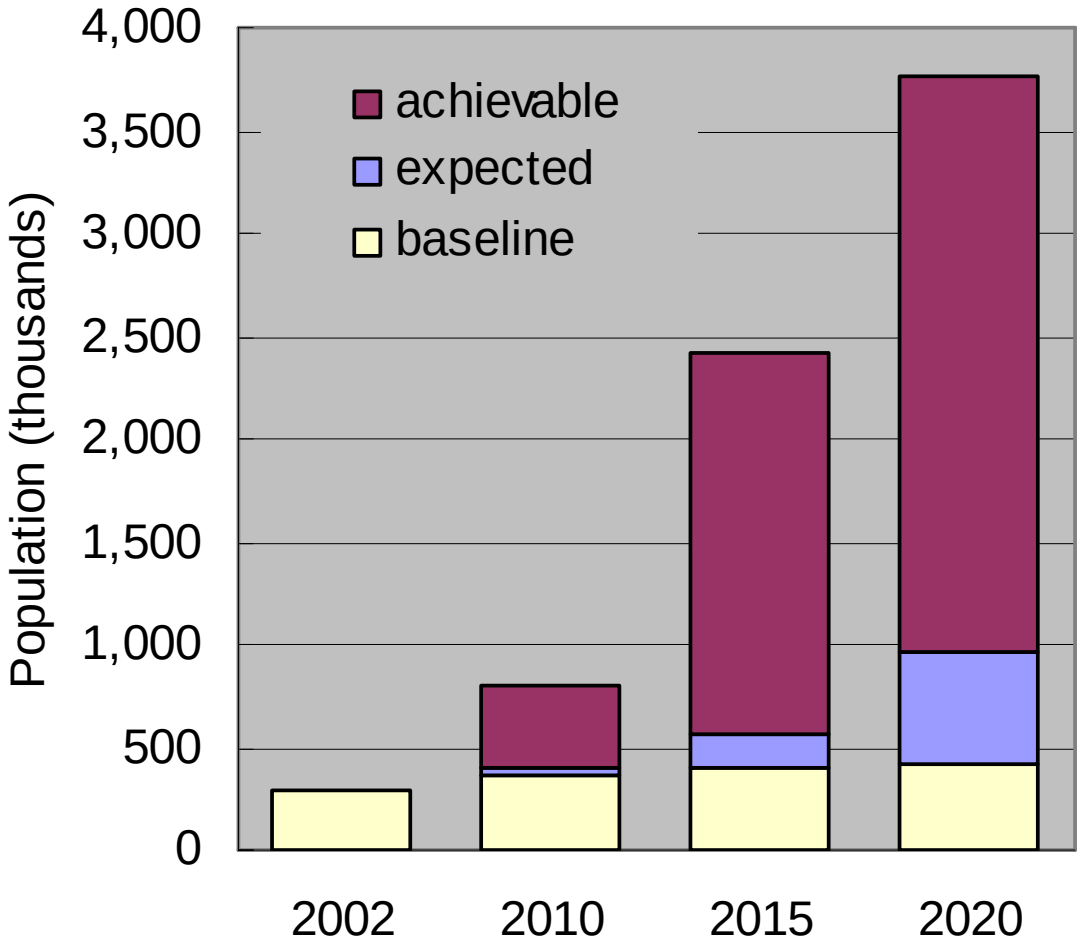
- Study performed for the California Electric Transportation Coalition (CalETC)
- Study was an update of the 2002 A. D. Little study for CalETC:
  - "Report on the Electric Vehicle Markets, Education, RD&D and the California Utilities' LEV Programs", Final Report FR-02-109
- Previous study updated to
  - Expand end-use applications to 19
  - Estimate electric demand and emissions benefits (GHG, NOx, ROG, and PM)
  - Estimate petroleum reduction
- Methodology included 2002 baseline populations and estimated populations for 2010, 2015, and 2020 for two scenarios
  - "Expected" market growth —natural growth plus growth associated with current regulations and incentive programs
  - "Achievable" market growth—includes above plus statewide legislative, regulatory and/or incentive programs that focus on near-zero-emission and zero-emission technologies

Transportation technologies broadly defined in study to include on road and off road applications both which are mostly dependent on petroleum fuels

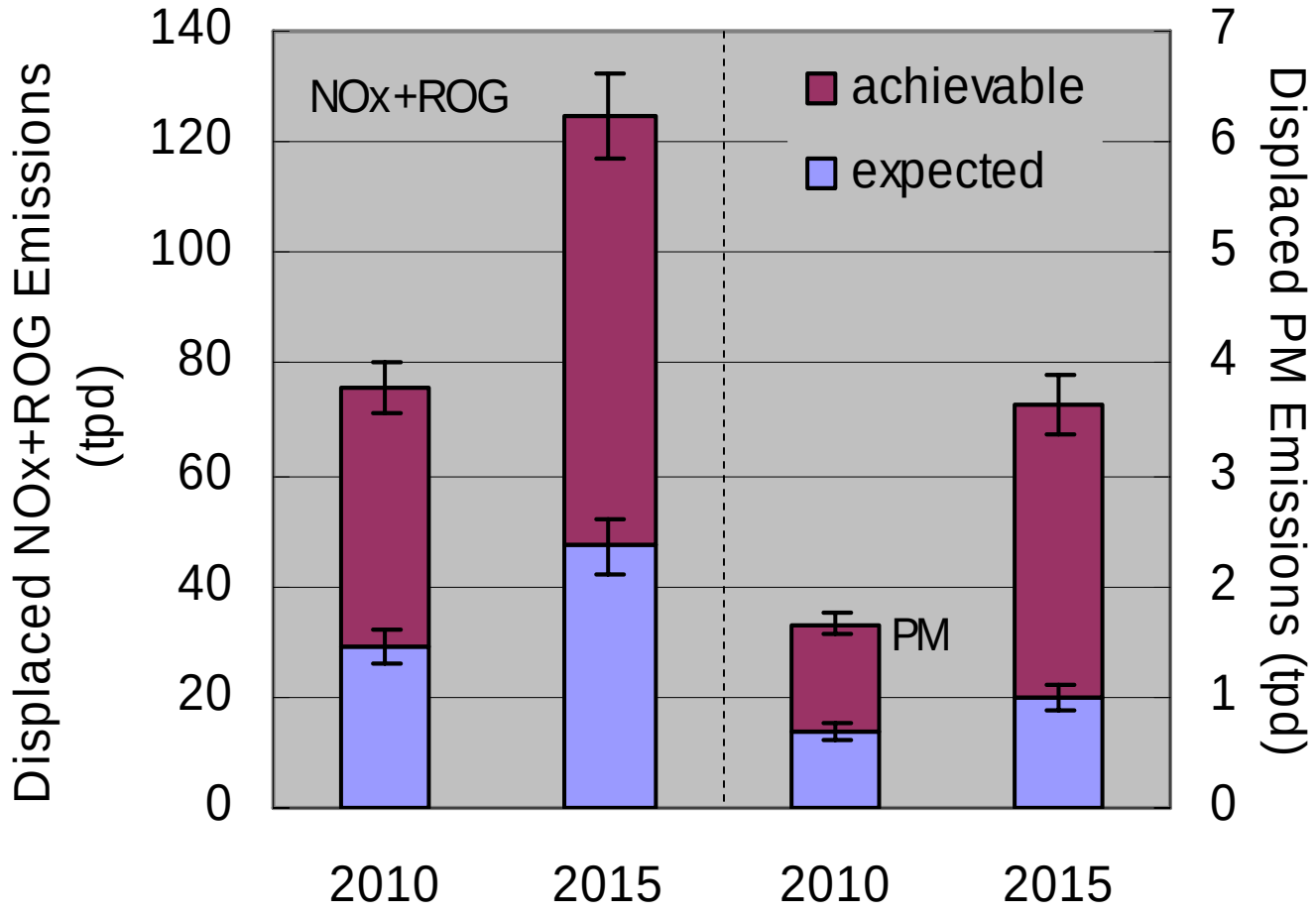
Technologies	
truck stop electrification (TSE)	electric lawn and garden equipment (from new SORE list)
Ports: cold-ironing (alternative marine power)	electric sweepers / scrubbers
port cargo handling equipment	Burnishers
electrified transportation refrigeration units (e-TRUs, from CARB staff report)	electric forklifts: Class 3
airport GSE	electric personnel and burden carriers
electric forklifts: Class 1 and 2	turf trucks
tow tractors/industrial tugs	full-size, city, and neighborhood BEVs
electric golf carts	plug-in hybrid EVs
	hydrogen fuel cell vehicles

Electric drive technologies meet the needs of a diversified set of transportation and goods movement industries

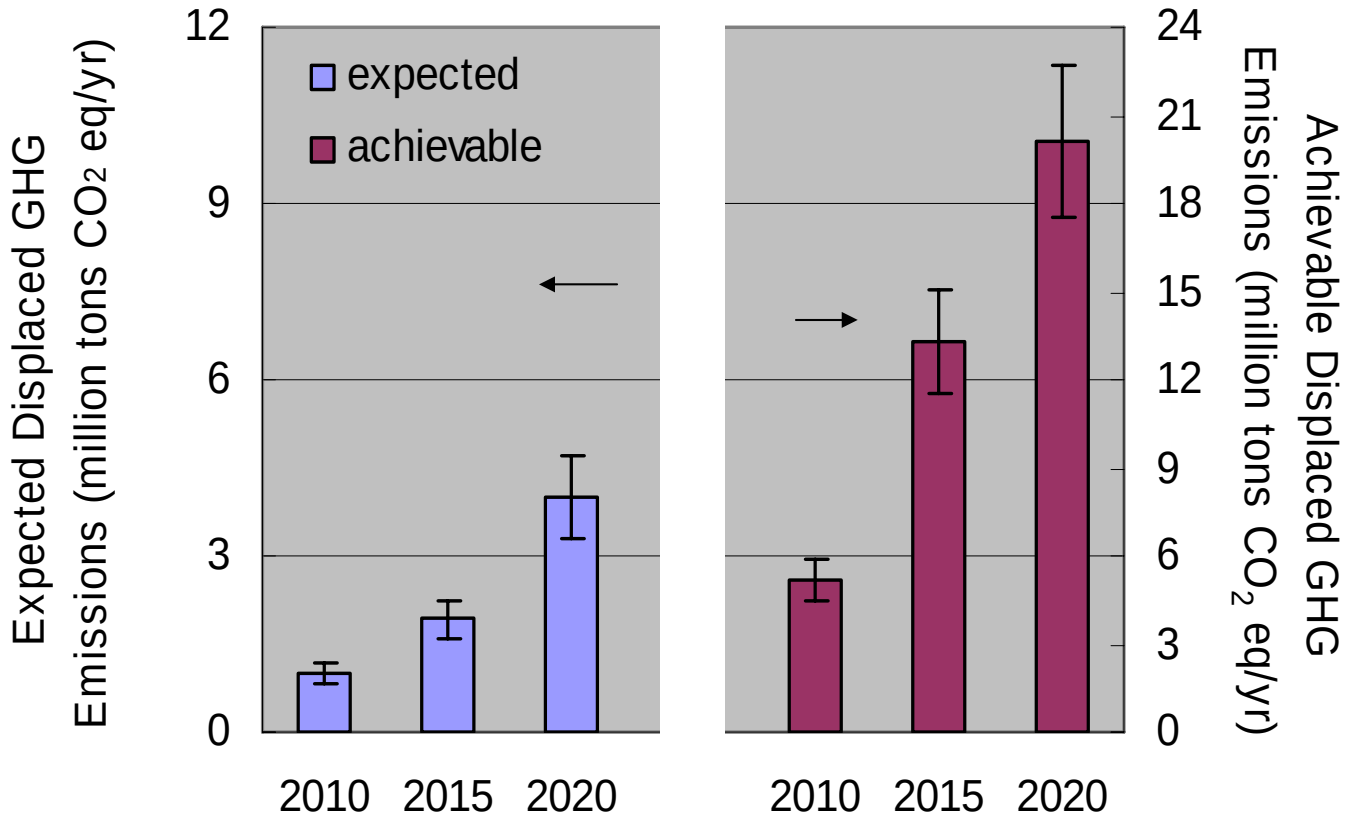
Expected and Achievable Population of Electro-drive Technologies in California



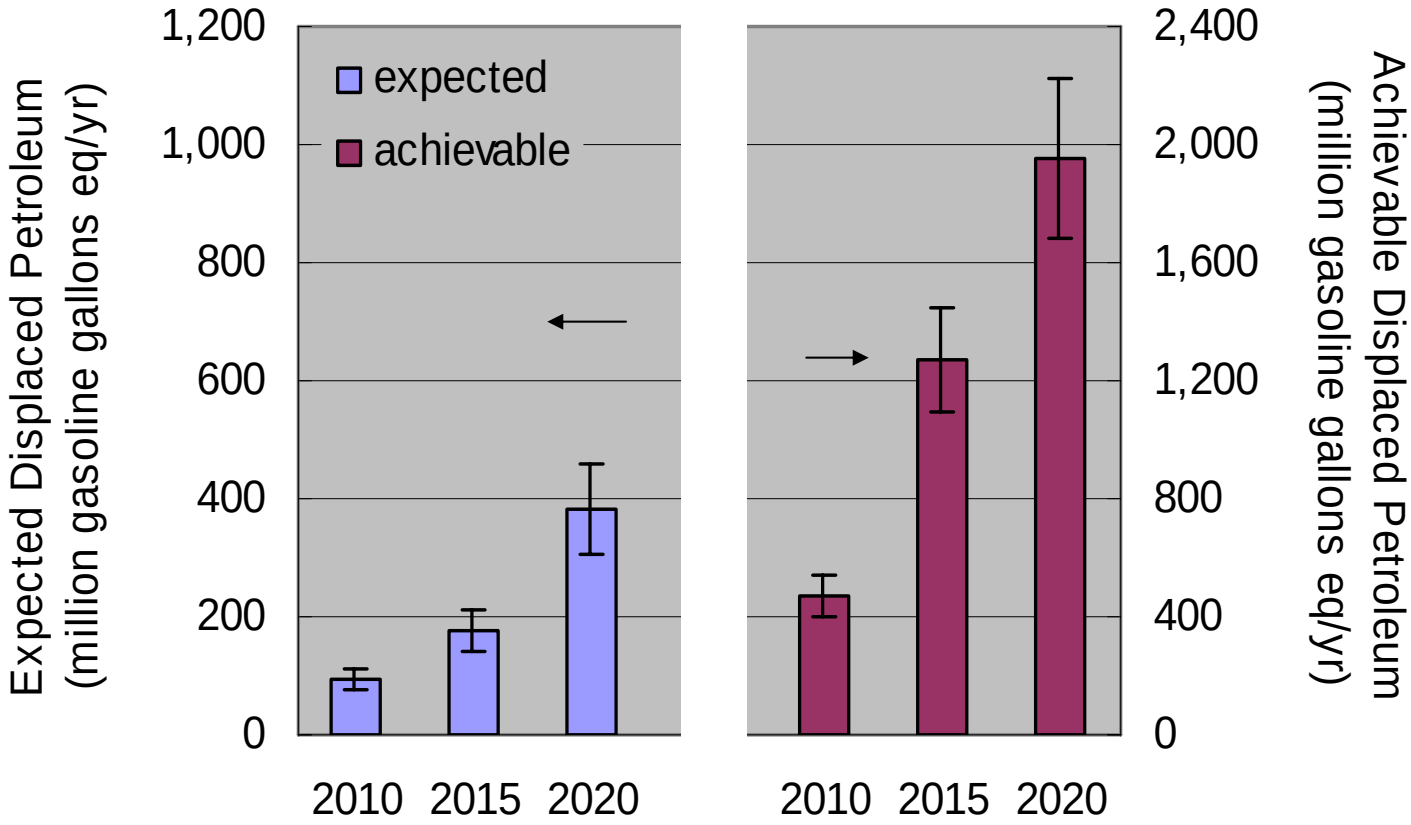
Expected and Achievable NOx + ROG and PM Emissions Displacement in California



Expected and Achievable Greenhouse Gas Emissions Displacement



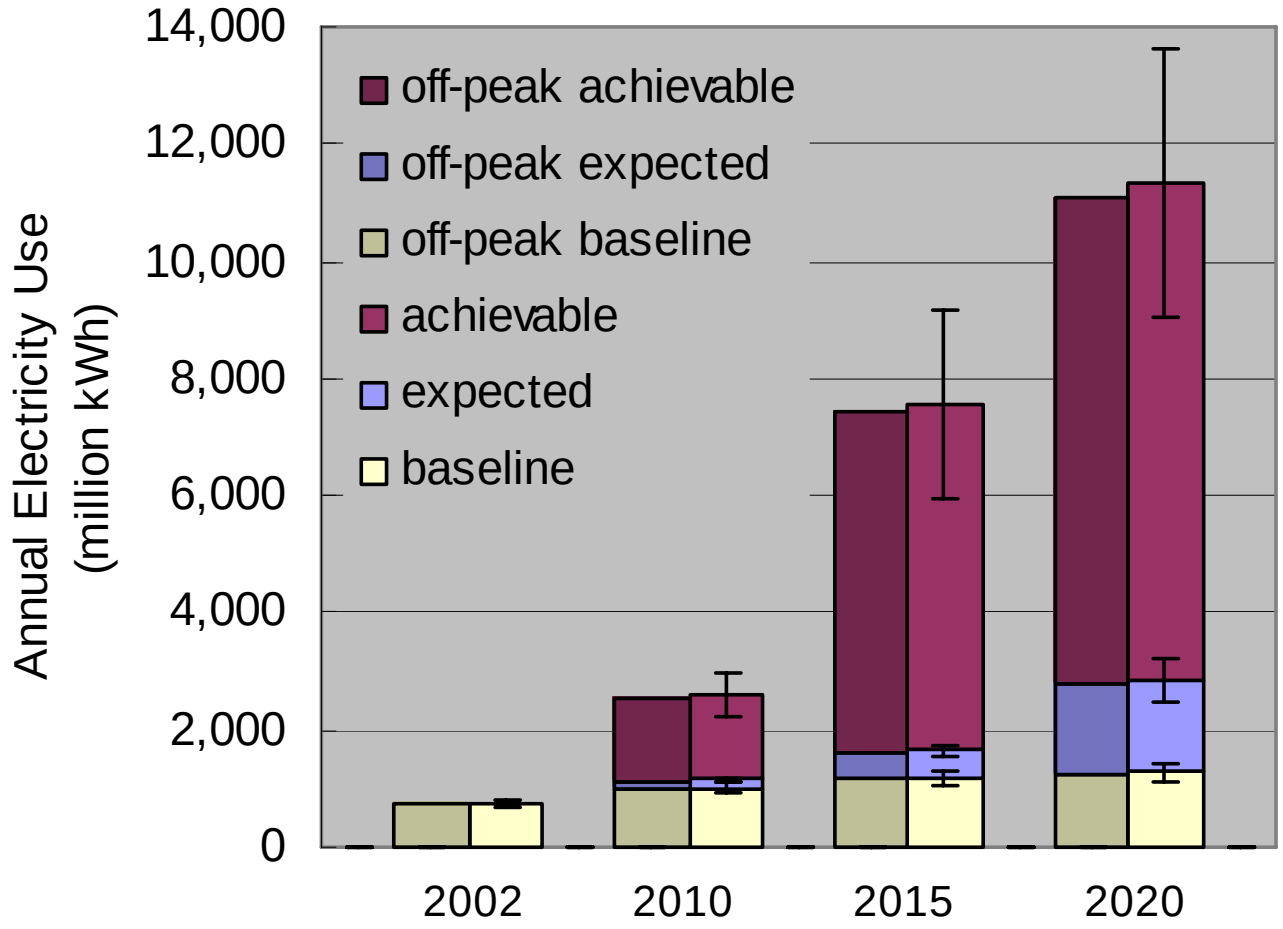
Expected and Achievable Petroleum Displacement



Electric drive technologies offer combined benefits of reduced criteria emissions, reduced greenhouse gas emissions, and reduced petroleum consumption

- Electric drive technologies are a viable component of a portfolio to reduce emissions and petroleum use
- Today electric drive technologies compete well in markets such as
  - lift truck market with a market share of 60%
  - lawn and garden equipment with a market share of 38%
  - Burden/personnel carriers, turf trucks with a market share of 40%
  - Sweepers, scrubbers, and burnishers with a market share of 80+%
- Electric drive growth markets that can have a significant impact on reducing emissions and petroleum use are
  - Light duty plug in hybrids and fuel cell vehicles
  - e-Truck Refrigeration Units and Truck Stop Electrification
  - Port equipment and other large non-road applications

Expected and Achievable Annual Electricity Demand



Expected and Achievable Peak Load